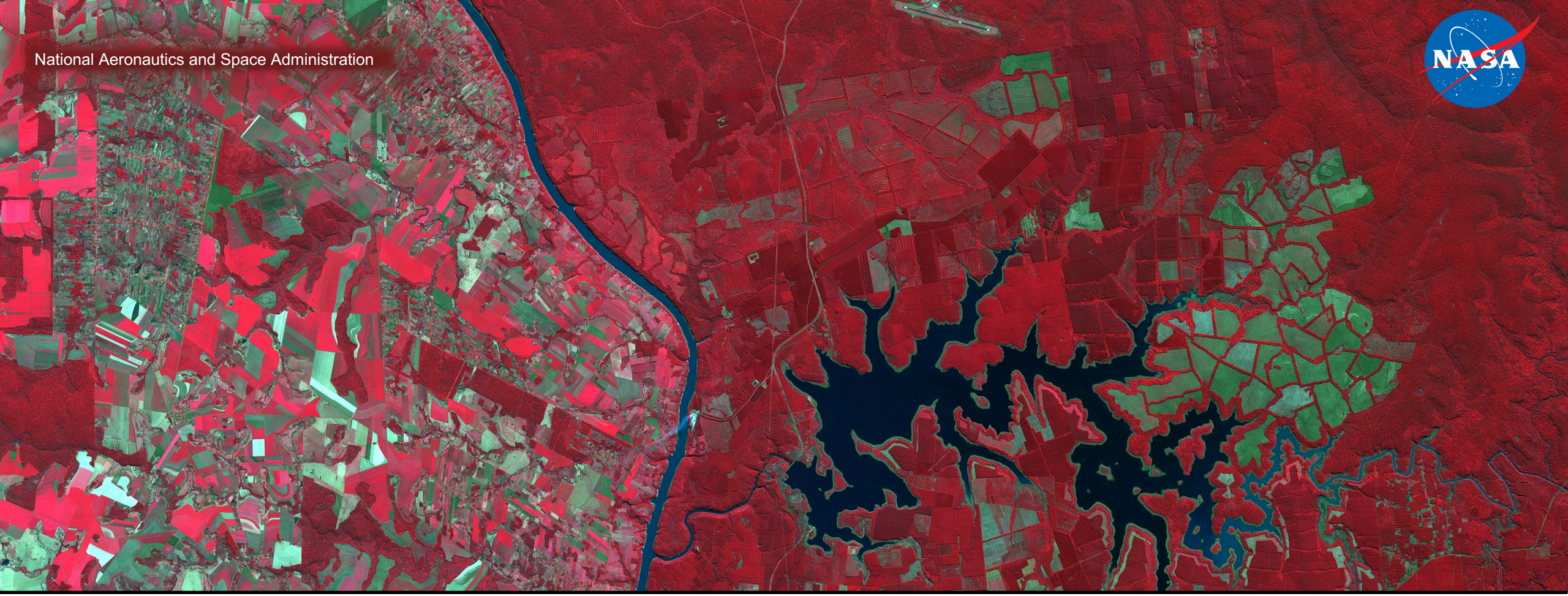

Access SRTM Terrain Data

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1 December 2017

Objectives

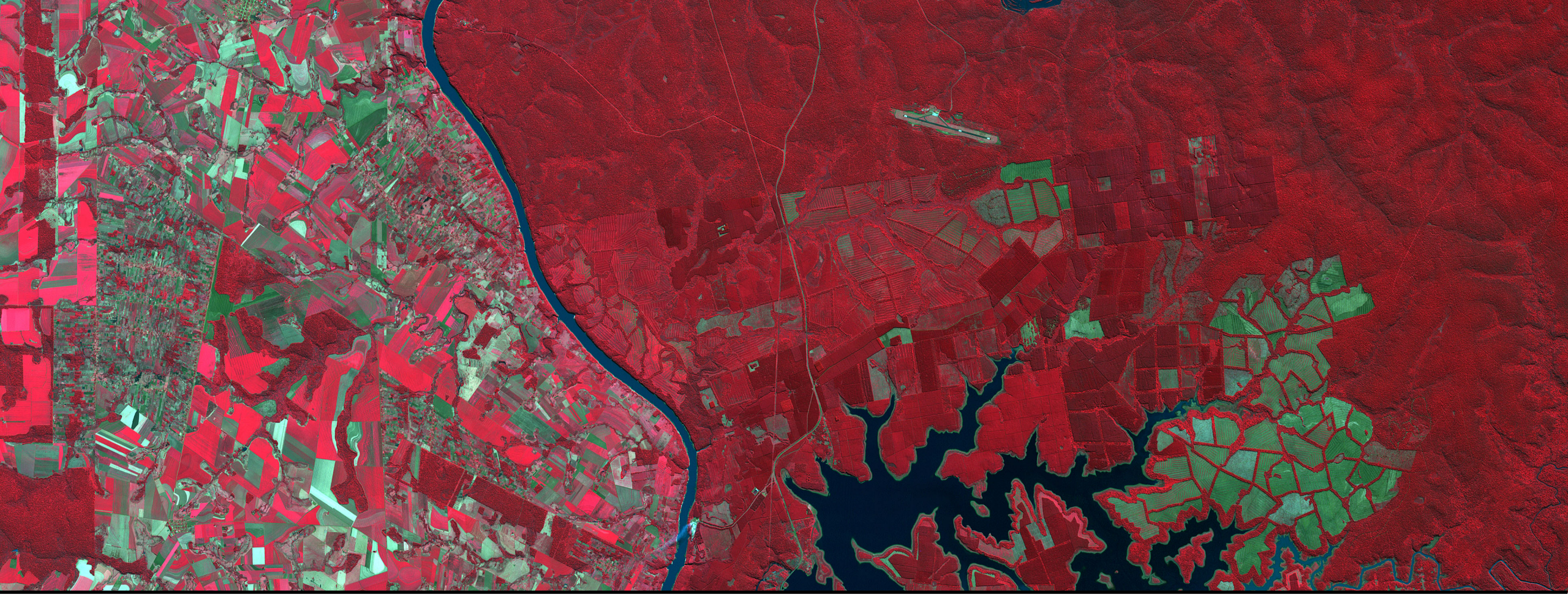
By the end of this exercise, you will be able to select, download, and analyze SRTM terrain data over the Sao Francisco Verdadeiro (SFV) watershed using the GDeX portal and QGIS.

Requirements

- QGIS installed on your computer
  - https://arset.gsfc.nasa.gov/sites/default/files/water/drought/Introduction%20to%20QGIS.pdf
- A shapefile for the Sao Francisco Verdadeiro watershed saved on your computer
  - http://arset.gsfc.nasa.gov/
- Uesr account for NASA Earthdata portal: http://earthdata.nasa.gov/

Outline

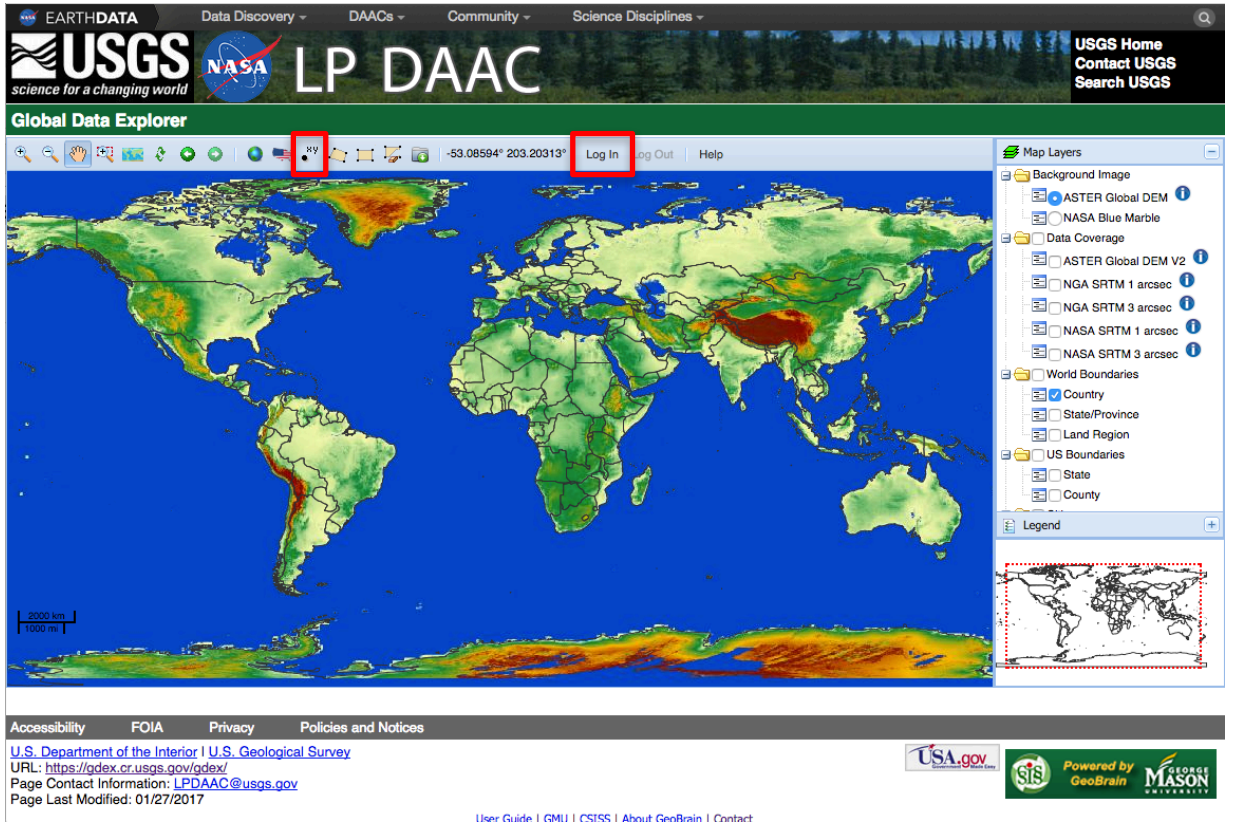
- Part 1: Access, Import, and Visualize SRTM Elevation Data Products
- Part 2: Import and Visualize SRTM Elevation Data in QGIS
- Part 3: Derive Slope from the SRTM Digital Elevation Model



Part 1: Access, Import, and Visualize SRTM Elevation Data Products

Access, Import, and Visualize SRTM Elevation Data Products

1. Go to the GDEx portal: http://gdex.cr.usgs.gov/gdex/
2. From the top menu bar, click **Log In**
3. Login with your NASA Earthdata username and password
4. Click on the **xy** in the menu bar, and you will get a window to enter the desired latitude and longitude to select a rectangular region

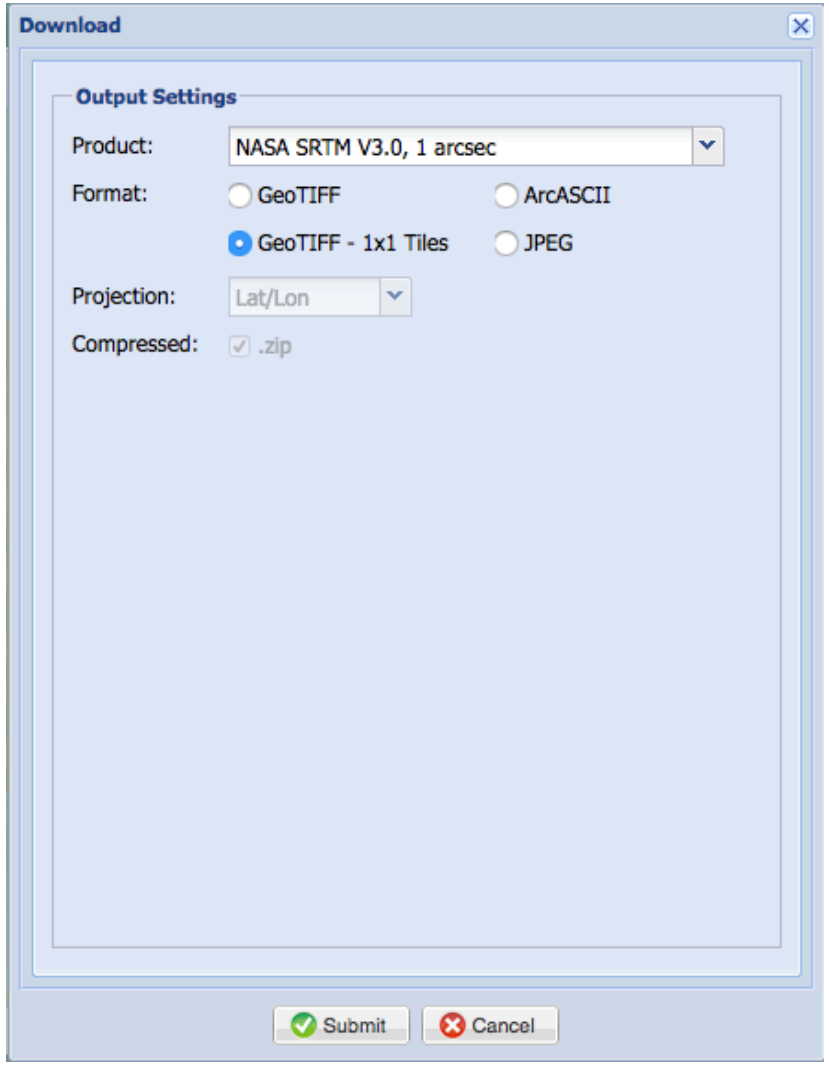


Access, Import, and Visualize SRTM Elevation Data Products

5. Enter
   - North Latitude: –24.5
   - South Latitude: -25.2
   - West Longitude: -54.1
   - East Longitude: -53.4
     - Note: this covers the SFV watershed
6. Click **submit**
7. You will see a box over the SFV watershed
8. Click on the **download** button in the menu bar. A window will pop up.

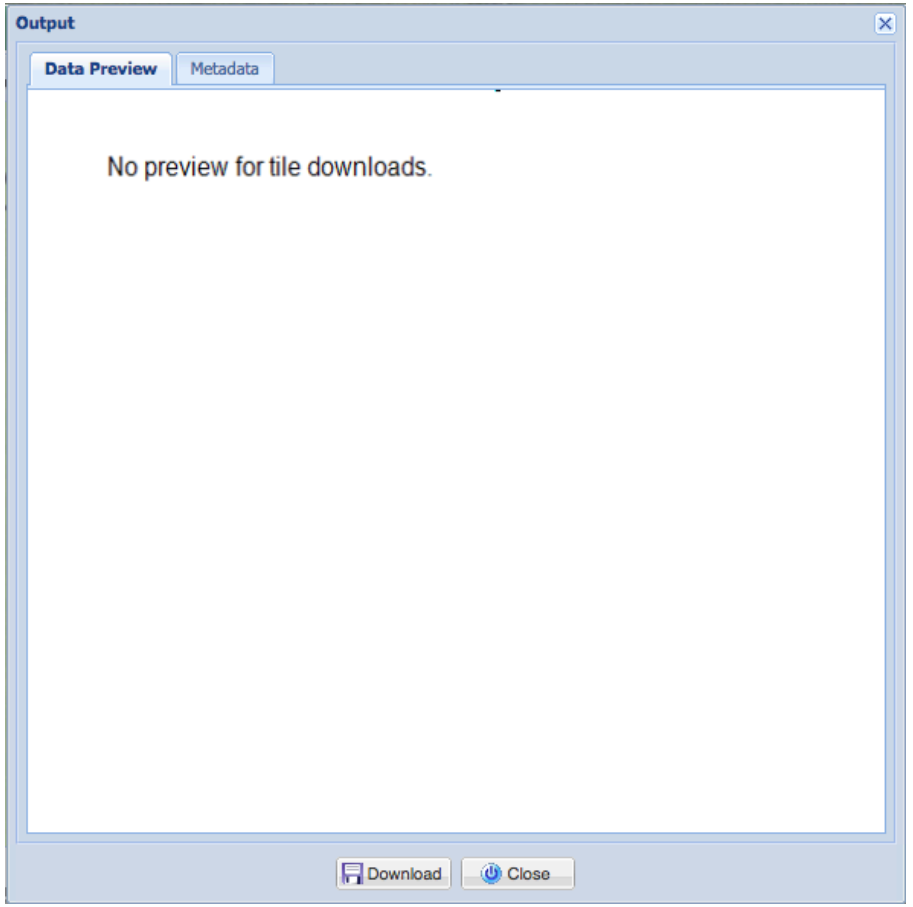
Access, Import, and Visualize SRTM Elevation Data Products

9. Next to Product, select **NASA SRTM V3.0, 1 arcsec** from the drop-down list
10. Select **GeoTIFF – 1x1 Tiles**
11. You will get a message window: **Please Wait: Your request is being processed**
    - Note: The number of tiles cannot exceed 36. If the domain is too large, then the data has to be downloaded in multiple steps



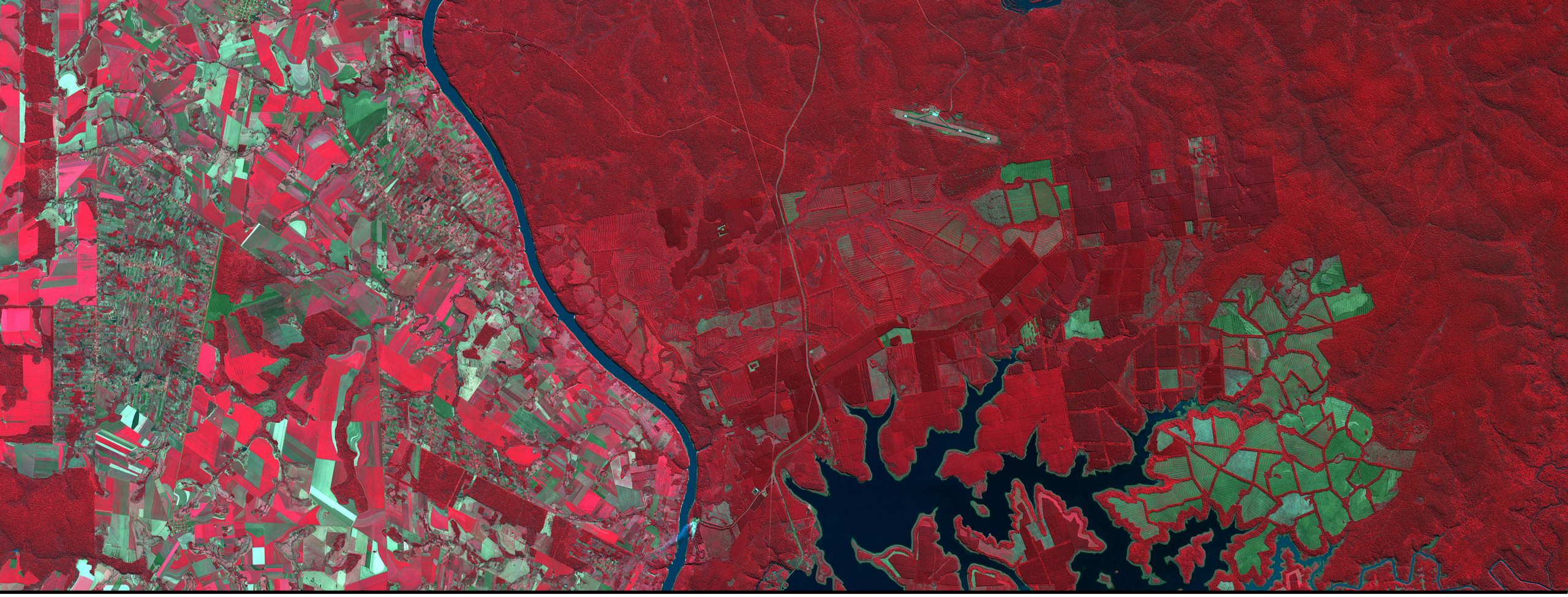
Access, Import, and Visualize SRTM Elevation Data Products

12. Once the data files are ready to be downloaded, you will get a window where you can select **Download**.
13. Save the data files on your computer. You will be able to name the data when you save the files.
14. You will see the data in a .zip file after you save them on your computer.
15. Double click to unzip the data.
16. You will get a folder with SRTM terrain tiles in TIFF format



Discussion Question

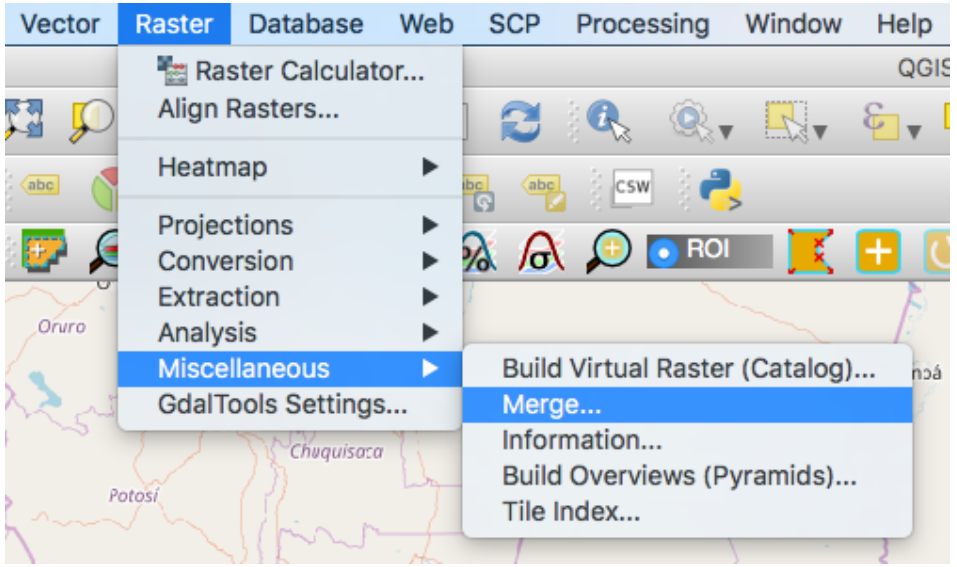
1. How may TIFF files do you see in the folder?



Part 2: Import and Visualize SRTM Elevation Data in QGIS

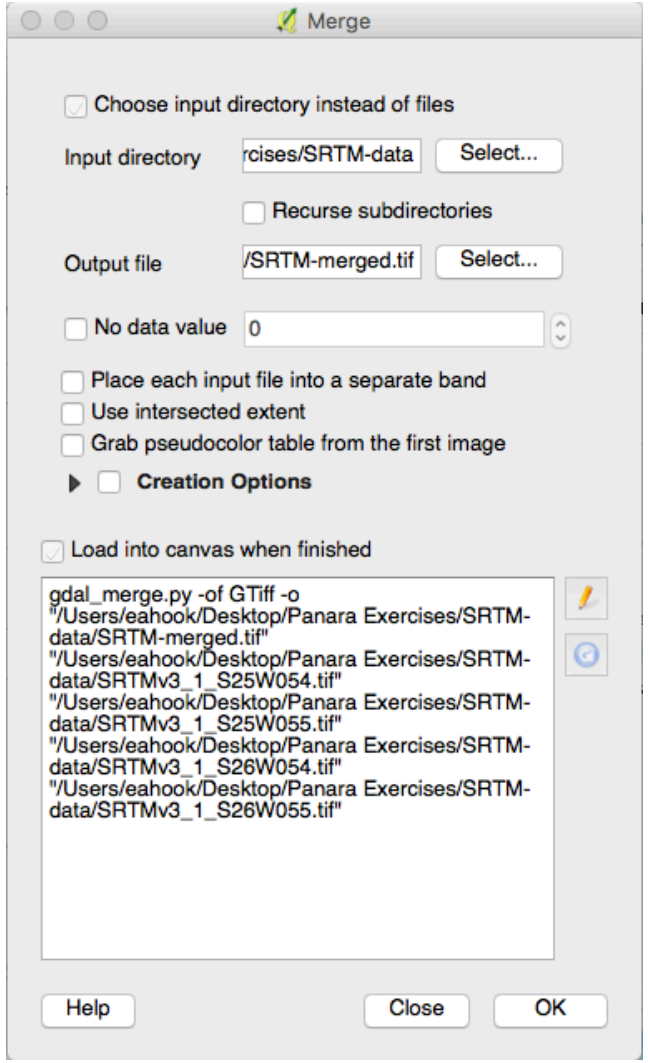
Import and Visualize SRTM Elevation Data in QGIS

1. Open **QGIS** on your desktop
2. Add in a base map from **Web** using the **OpenLayers Plugin**
3. Choose the base map **OpenStreetMap**
4. Zoom in on the study area in southern Brazil
5. Go to the QGIS top bar and click on **Raster**
6. From the drop-down menu, go to **Miscellaneous** and select **Merge**
7. A window will open for you to navigate to the location of the downloaded SRTM product



Import and Visualize SRTM Elevation Data in QGIS

8. Select **Choose input directory instead of files** since there are multiple SRTM tiles in the .tiff files (you can also choose to merge one tile at a time)
9. Click **Select** next to **Input Directory**
10. Select the folder with your SRTM TIFF files
11. You will see a list of all the files in the directory under **Load into canvas when finished**
12. Click **Select** next to **Output File.** This will open a new window where you can **Select where to save the merge output.**
13. Click **OK** at the bottom of the window

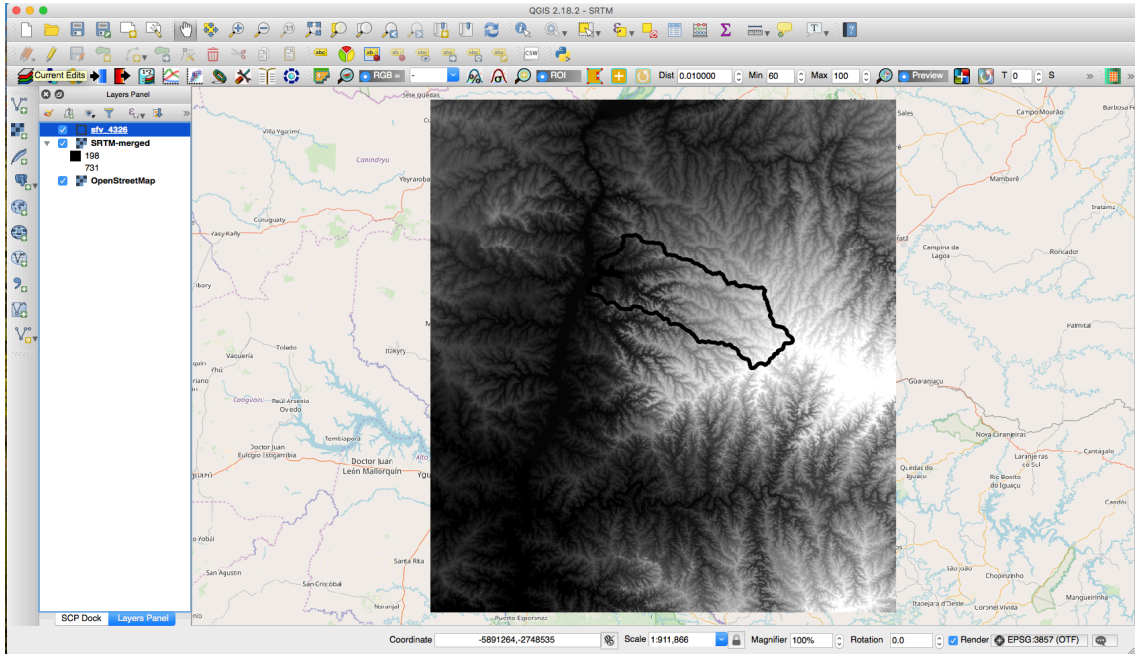


Import and Visualize SRTM Elevation Data in QGIS

14. It may take a few seconds to a few minutes for the files to save – it depends on the number of tiles being merged
15. Once the tiles have been merged, the new raster with the output file name you assigned will be imported on the QGIS window
16. On the left menu bar, click **Add Vector** to add the SFW shapefile: sfv_4326.shp

Import and Visualize SRTM Elevation Data in QGIS

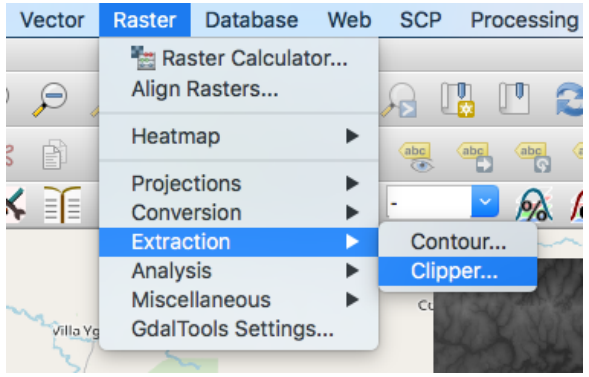
17. Make the shapefile layer transparent with only the boundary outlined on the map
    - Right click on the layer file and go to **Properties** > **Style**
    - Click on the down arrow in the **Fill** window and select **Transparent fill**
    - Click on the down arrow in the **Outline** window and choose a color of the shapefile boundary (The example uses black)
    - Choose **outline width** to be 2.0

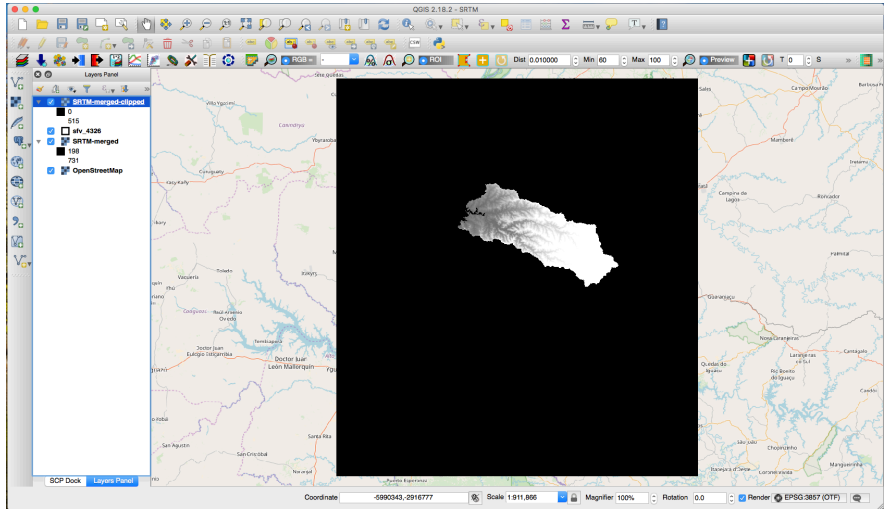


You will get the merged terrain raster layer and the shape file on outline in the QGIS window

Import and Visualize SRTM Elevation Data in QGIS

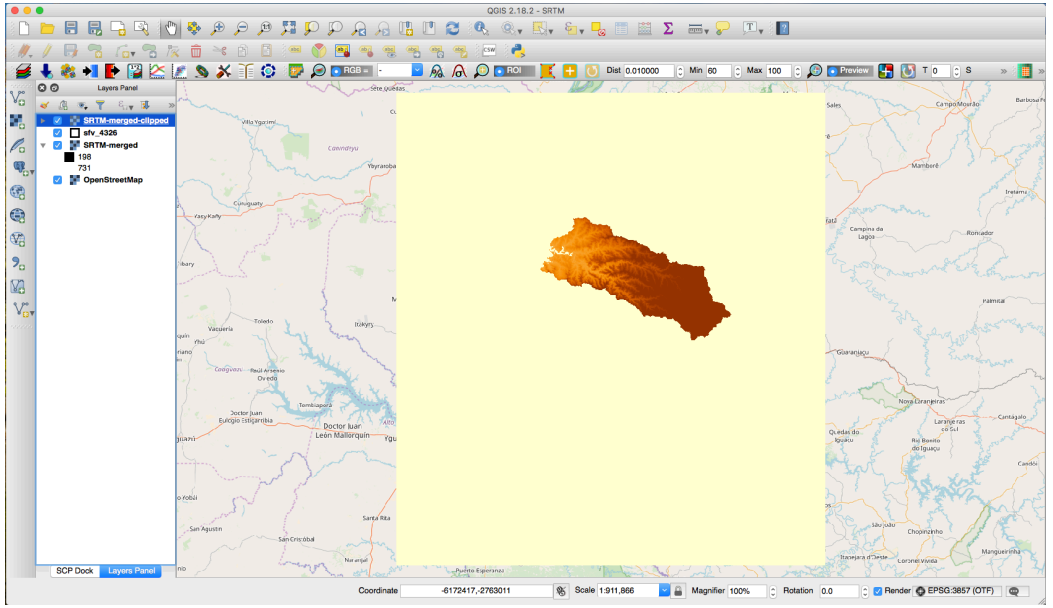
18. Now clip the merged SRTM terrain raster to the SFV shape file
   - On the top bar go to **Raster** > **Extraction** > **Clipper** to open the Clipper options window
   - In the Input File (raster) window select: SRTM-Merged.tif.
   - In the Output file window select output folder and enter file name (Suggestion: SRTM-Merged_Clipped)
   - Check the **Mask Layer** and in the **Mask Layer** window select the shapefile named sfv_4326
   - Click **OK** on at the bottom right





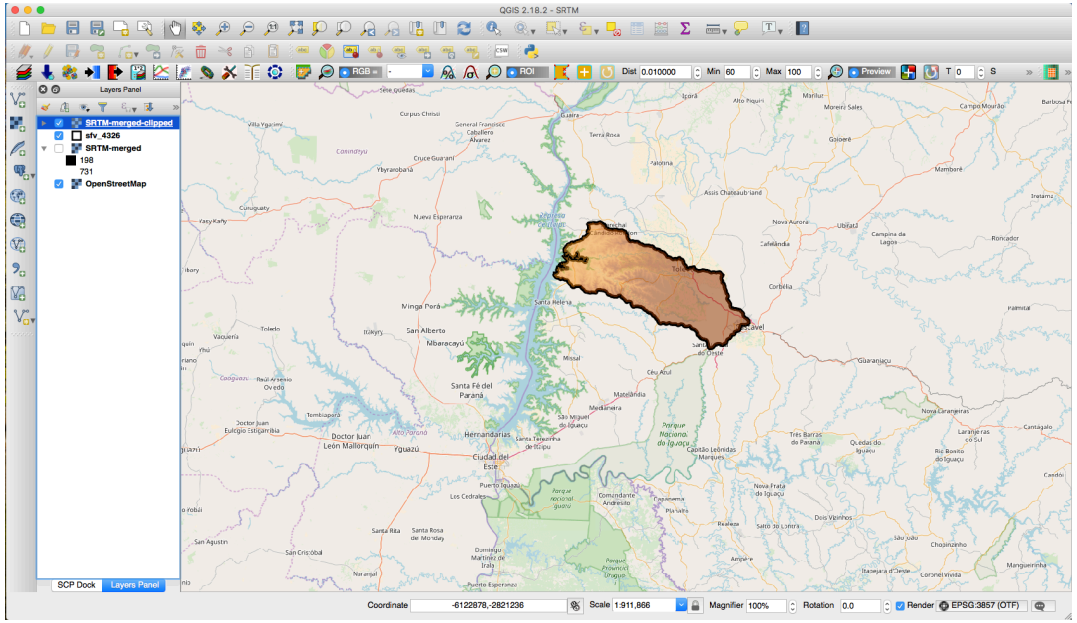
Import and Visualize SRTM Elevation Data in QGIS

19. You should see the data clipped by the shapefile boundary (Figure 5) Right click on the clipped raster layers one at a time and follow the steps to get colored Terrain maps:
    - Go to **Properties** > **Style**
    - Select the **Render Type** as **Singleband Pseudocolor**
    - Next to **Color**, make sure the color palette is Yellow-Orange-Brown by selecting (**YlOrBr**)
    - Below the color display, change the **Mode** to **Equal Interval** and **Classes** to 20. Click **Classify**, then click **Apply**.
    - Click **OK** to close the Change Color box



Import and Visualize SRTM Elevation Data in QGIS

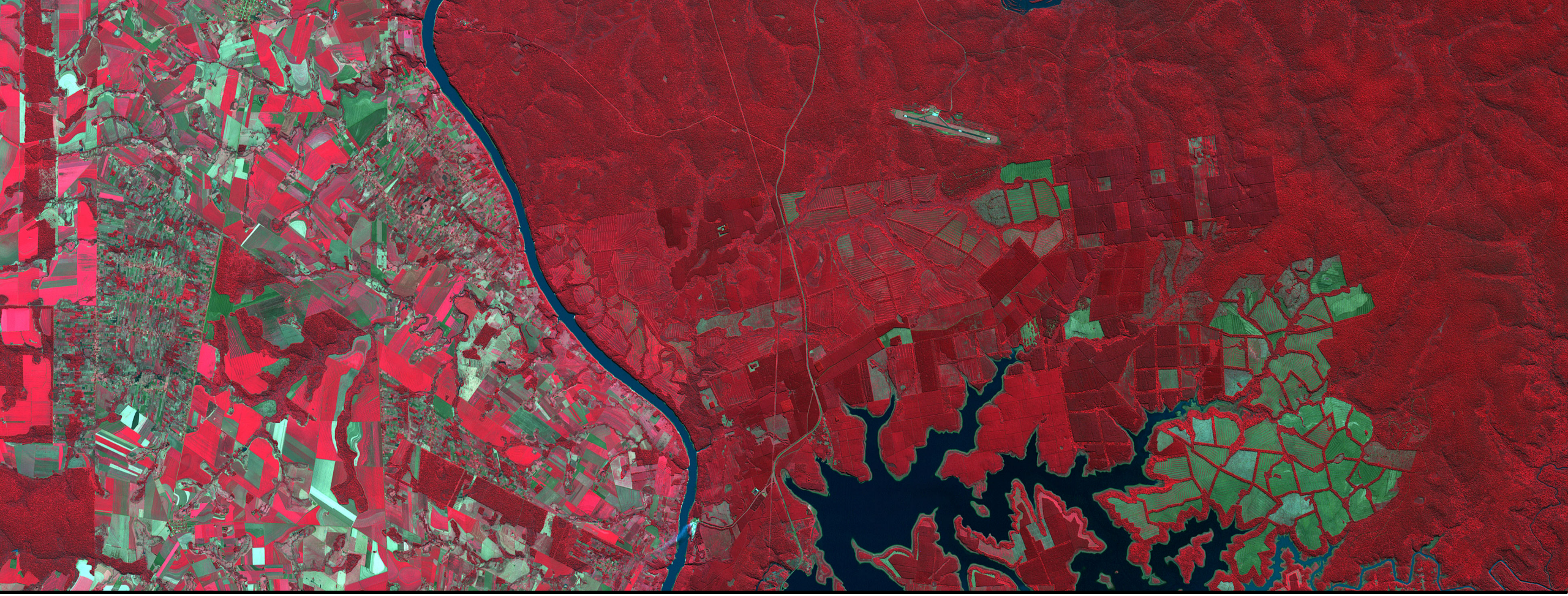
20. Make the clipped layer transparent to see the map underneath and to mask 0 terrain values
   - Right click on the layer file and go to **Properties** > **Transparency**
   - Set the **Transparency** level to 50%
   - Under **No data value** enter 0 in **Additional no data value**
21. Click **Apply** and then **OK**
22. Zoom on the terrain layer and view the details



Discussion Questions

1. Which region has higher elevation over the SFV? (East, West) *Note the maximum elevation values with units*

2. Which region has a more uniform elevation? (East, West)

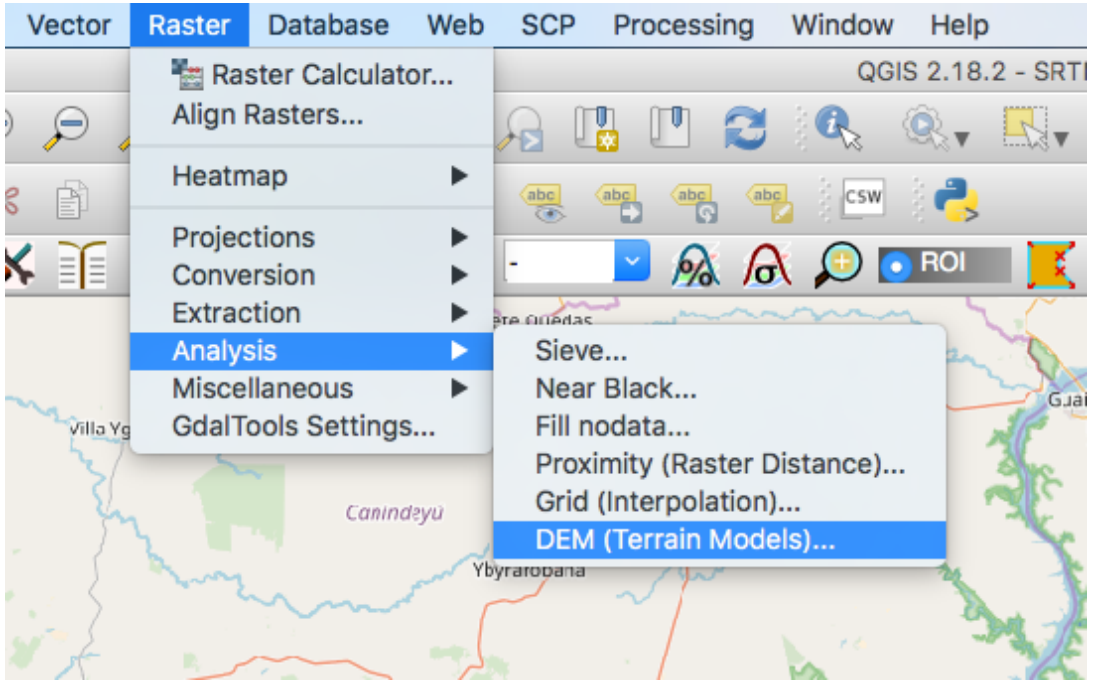


Part 3: Derive Slope from the SRTM Digital Elevation Model

Derive Slope from the SRTM Digital Elevation Model

Using the SRTM elevation now in QGIS, we can create a slope product using the DEM (Terrain Models) Tool

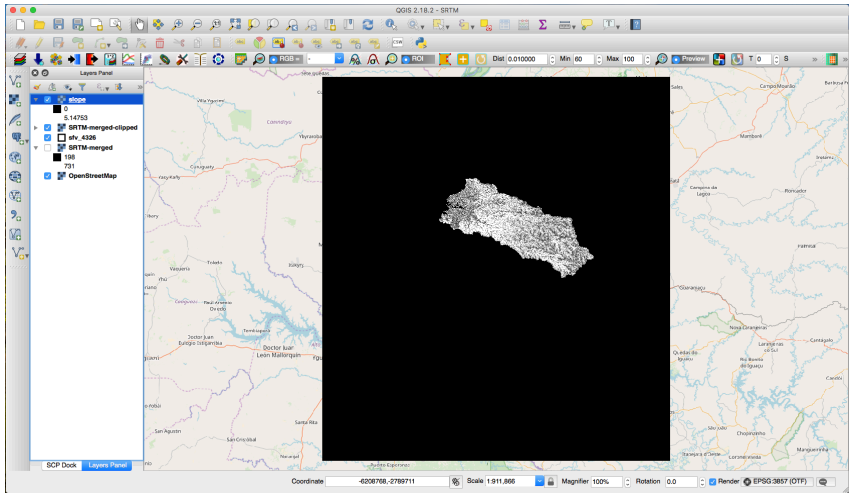
1. In the top menu, select: **Raster** > **Analysis** > **DEM** (Terrain Models)
2. In the dialog that appears, ensure the Input file is the SRT-Mearged_Clipped file we just visualized

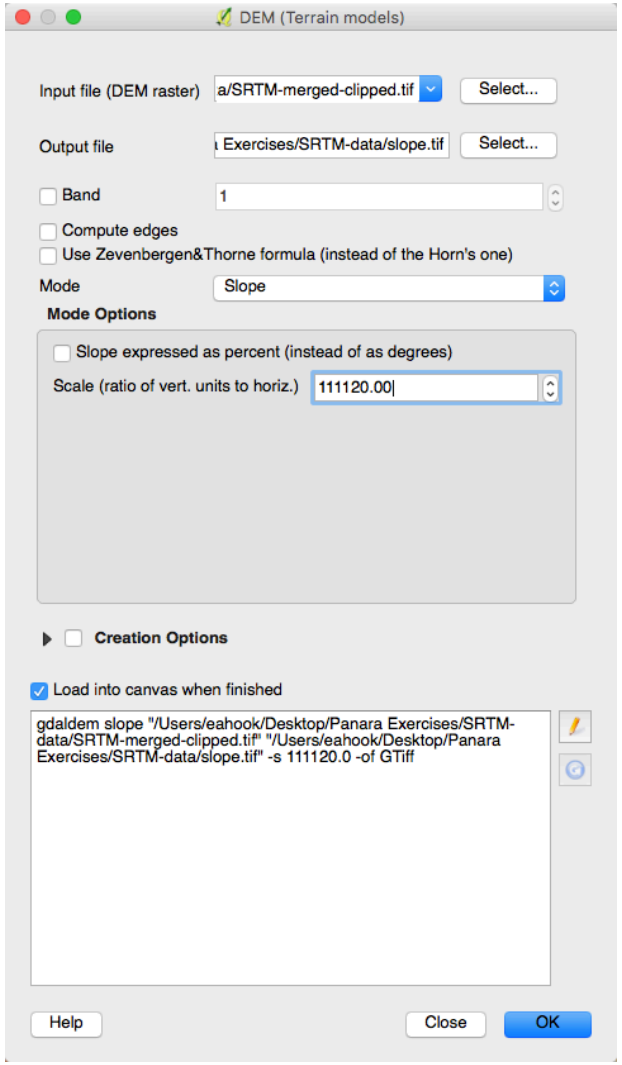


Derive Slope from the SRTM Digital Elevation Model

3. Set the Output file to a folder and name ending in .tiff (Suggestion: slope.tiff)
4. Set the **Mode** option to **Slope**
5. **Do not check the Slope expressed as percent box** – the slope will be in degree
6. In the **scale (ratio of vert. units to horiz)** box, enter 111120.00 to convert the units to meters
7. Click **OK**

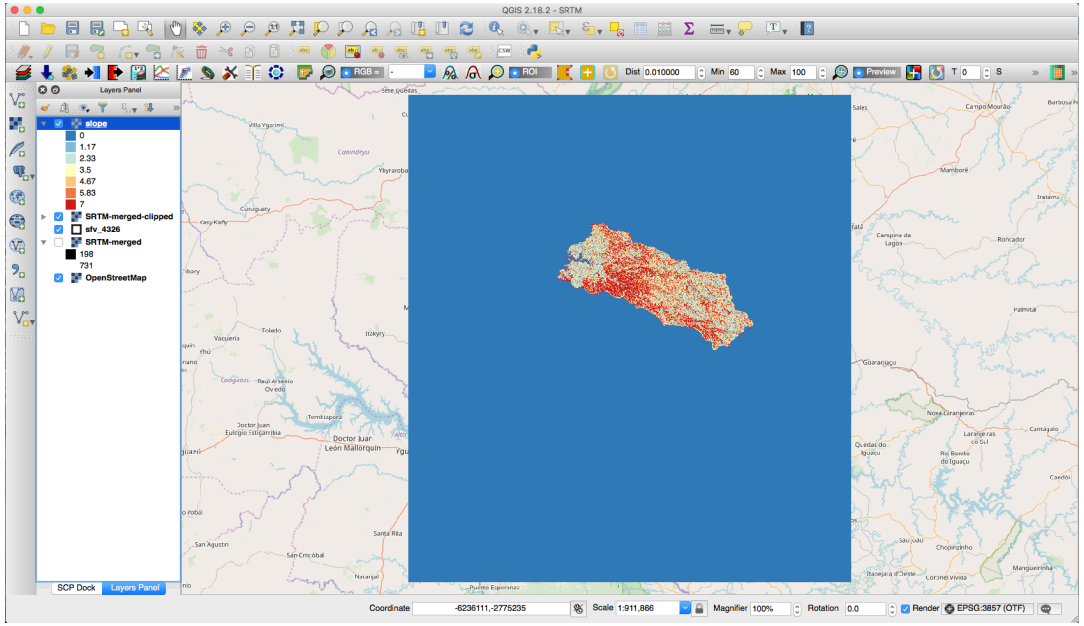
- The resulting image displays the slope in degrees





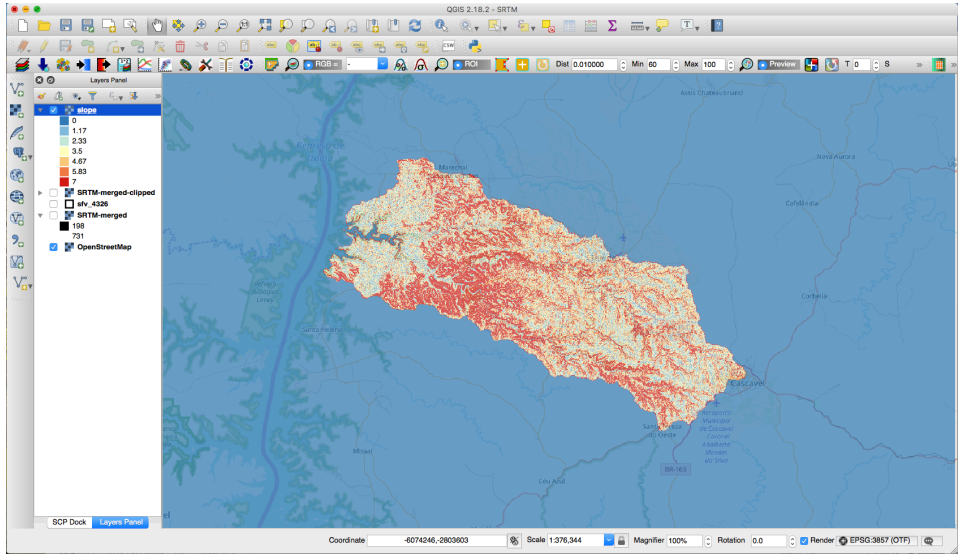
Derive Slope from the SRTM Digital Elevation Model

8. Change the color of the slope by right clicking on the **Slope** layer, selecting **Properties** as done before for the clipped terrain layer
9. Set Min and Max values to 0 and 7 respectively
10. Choose color to RdYlBl (Red-Yello-Blue) and check **Invert** so that blue color red color shows higher slope than blue
11. Set **Mode** as **Equal Interval**
12. In classes, enter **7** intervals
13. Click on **Apply**



Derive Slope from the SRTM Digital Elevation Model

14. From the left side menu select **Transparency** and choose the appropriate percent (30%) value of transparency to see the OpenStreet Map under the precipitation layer
15. Click on **OK**
16. You will get the slope map
17. The high slopes are red, and the low slopes are blue
18. Generally, low slope terrain surrounded by higher slope terrain has an increased potential for waterlogging



Questions

1. Can you identify channels wish low slope where flow accumulation may occur?

2. Looking at the slope values would you consider this watershed as highly variable terrain area?